

CASE STUDY:

Ohio and Michigan

Methyl Parathion Investigations

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1. INTRODUCTION

Since the early 1990s, there have been a number of investigations involving the illegal use of highly toxic restricted use pesticides (RUPs) in urban environments. Recent events in EPA Regions 4, 5, and 6 involving such illegal use have presented serious threats to human health and cost the public literally millions of dollars in cleanups. Each of these investigations involved the illegal use of methyl parathion.

Methyl parathion is an RUP that is registered for use primarily on cotton. It should be used only by certified applicators or persons working under the direct supervision of a certified applicator.

In the recent investigations, methyl parathion was illegally applied indoors to literally hundreds of homes and other residential settings to control cockroach infestation. Such events have highlighted distinct deficiencies in pesticide regulatory programs, including basic pesticide program requirements pertaining to applicator certification, retail sale of RUPs, distribution of original unopened containers, and pesticide use consistent with product labeling.

The purpose of this case study is to assist federal, state, and local pesticide and health-related programs in identifying and preventing illegal diversion and misuse of agricultural pesticides, thereby reducing human health impacts and gross contamination of dwellings and small businesses. It will hopefully serve as a learning tool for federal, state, and local regulatory agencies to be used in conjunction with other EPA or state tools to successfully detect and deter similar events in the future. This case study identifies:

- Deficiencies in regulatory, enforcement, and outreach/education programs that allowed the diversion and misuse of methyl parathion by specific individuals or entities.
- Changes already initiated, the effectiveness of the action taken, suggestions for further improvement, and barriers to such changes.

To identify and evaluate the deficiencies and changes, individuals at all levels of government who had been involved in the methyl parathion investigations were interviewed. Research was also conducted to identify documents related to the investigations and methyl parathion in general. The following sections of this case study present the methodology for developing the case study; an overview of methyl parathion, including its characteristics, toxicity, and regulatory status; a description of the Ohio and Michigan methyl parathion investigations; major findings from the interviews and research; and recommendations.

2. METHODOLOGY

To develop the case study, individuals involved with either the Lorain County, Ohio, or Wayne County, Michigan, methyl parathion misuse investigations and representing federal, state, and

local governments were interviewed. The purpose of the interviews was to collect information and data regarding the characteristics, contributing factors, and causes of the misuse investigations from various perspectives.

To ensure all interviews were conducted in a consistent manner and that all issues and questions were covered, an interview protocol was developed. The protocol was completed for each interviewee and became the basis for the preparation of this case study. From the interview notes, a general summary of findings was developed. These findings are attached as Appendix A.

To supplement the interviews and provide additional information for the case study, research was also conducted into methyl parathion and other recent related misuse investigations. A variety of data and information ranging from EPA fact sheets and press releases to toxicity data to usage patterns were collected. The research provided a background understanding of methyl parathion as well as its regulatory and use history.

3. WHAT IS METHYL PARATHION?

Methyl parathion, also known as “cotton poison,” is an organophosphate insecticide that by law can be used only in agricultural fields to control insects. It is commonly used on cotton, soybeans, and vegetables. Methyl parathion is acutely toxic to mammals, smells like rotten eggs, and can leave a yellow stain on interior areas where it has been applied. It enters the environment primarily through application to farm crops and is rapidly broken down to other chemicals in water and soil. Methyl parathion has been manufactured in the United States since 1952 and has been marketed under a variety of product names, including Nitrox, Pennicap-M, Dithon 63, Ketokil 52, Seis-Tres 6-3, Metaspray 5E, and Paraspray 6-3.

Since methyl parathion is exclusively an agricultural pesticide, the general public is not exposed to it, as long as it is used legally. The ways one might be exposed to methyl parathion are specific. Exposure is most likely for those who live or work near or on a farm where methyl parathion is applied. Farm workers, pesticide applicators, or people who work in the pesticide manufacturing industry may be exposed to it. The illegal use of methyl parathion as an indoor pesticide also exposes people to its toxic effects. Methyl parathion has been detected in low levels in food.

Methyl parathion is an organophosphate that affects the central nervous system. Exposure to it can cause dizziness, confusion, headaches, difficulty breathing, chest tightness, blurred vision, sweating, and restlessness. Symptoms that may mean an exposed person’s condition is getting worse include muscle twitching, weakness, tremors, lack of coordination, abdominal cramps, vomiting, and diarrhea. Severe exposure can lead to convulsions, unconsciousness, cardiac arrest and death. Once exposed, the pesticide impacts the nervous system by inhibiting

breakdown of the transmitter acetylcholine by the enzyme acetylcholinesterase. This results in overstimulation of portions of the nervous system. This reaction is the cause of the above-mentioned symptoms.

The principal route of exposure is dermal. Swallowing and inhaling methyl parathion are also potential exposure pathways. Fetuses, infants, and small children are extremely vulnerable to methyl parathion. Humans are not the only species at risk from methyl parathion. Cats, dogs, birds, and other small animals can be easily exposed when they come into contact with contaminated surfaces. Due to their small body weights, exposed animals may quickly show signs of poisoning. Illnesses or deaths in animals after a pest control application can be a first warning that an illegal pesticide application has been made. A fact sheet with additional information on the characteristics and toxicity of methyl parathion is included as Appendix B.

3.1 Regulatory Status

As required by the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), every pesticide product manufactured in the United States must be classified as either “general use” or “restricted use.” According to FIFRA, a general use pesticide “when applied in accordance with its directions for use, warnings and cautions...will not generally cause unreasonable adverse effects on the environment.” On the other hand, a restricted use pesticide “may generally cause, without additional regulatory restrictions, unreasonable adverse effects on the environment, including injury to the applicator.” Such a classification is made by EPA after reviewing information and data submitted by the manufacturer of the specific pesticide product.

Methyl parathion is classified as a restricted use pesticide (RUP). As such, it can only be applied by or under the direct supervision of a certified applicator. In addition, it can only be purchased or sold to individuals with proof of certification. Under FIFRA, there are two categories of certified applicators:

- Private applicators, who use or supervise the use of any RUP for agricultural purposes on property owned or rented by them or their employer. As such, farmers who have fulfilled certification requirements are considered private applicators.
- Commercial applicators, who use or supervise the use of any RUP for any purpose or on any property other than as provided in the definition of a private applicator.

To become a certified applicator, individuals are generally required to demonstrate competency in the use and handling of pesticides. In general, states have the responsibility for certifying applicators, some require that applicators pass a written exam, others simply require the completion of training and an acknowledgment that the applicants understand pesticide safety and application principles.

While FIFRA and its implementing regulations establish federal requirements for the certification process, FIFRA also gives states the opportunity to develop and implement their own certification programs. If a state so desires, it can develop its own certification plan and submit it to EPA for approval. (To date, every state in the United States except Nebraska has chosen to implement and enforce its own program.) If approved, the state takes on responsibility for certifying individuals and ensuring compliance with the state program. All state requirements must be at least as stringent as the federal requirements. This functional equivalency ensures a somewhat uniform application of the certification requirements across the country.

In addition to the certification requirements, there are reporting and recordkeeping requirements pertaining to those who sell and use RUPs. Every state program must require that commercial applicators keep and maintain, for a period of at least 2 years, routine operation records containing information on the kinds, amounts, uses, dates, and places of application of RUPs. Additional reporting and recordkeeping, such as requirements for RUP dealers, are required in those states where the federal government operates the program, but are not required under state programs. Therefore, if a state is implementing its own program, it is not required to impose federal reporting and recordkeeping requirements on dealers.

4. THE METHYL PARATHION MISUSE INVESTIGATIONS IN OHIO AND MICHIGAN

The two investigations in Ohio and Michigan described below highlight an emerging pattern involving the illegal diversion of RUPs, particularly methyl parathion, from the agribusiness marketplace to low income minority communities, principally in urban areas. There is an urban market for such pesticides because of their efficacy on household pests, especially roaches. In both of the following investigations, methyl parathion was the chosen tool to control an extensive roach infestation. The pattern was further defined by a series of additional multiple site investigations occurring in Mississippi, Alabama, Louisiana, Tennessee, Arkansas, and Illinois during 1996 and 1997. Methyl parathion was the pesticide used in the vast majority of the applications. Applications were made by both pest control businesses and community residents. The pest control businesses were generally unlicensed and the applicators uncertified.

4.1 Lorain County, Ohio

In November 1994, EPA Region 5 was contacted by the Ohio Department of Agriculture and the Lorain County Health Department regarding an investigation into an uncertified and unlicensed pest control operator. The operator, Lutellis Kilgore, had been operating an unlicensed pest control business in economically depressed minority communities in Lorain County, Ohio, for more than 17 years and had applied methyl parathion to hundreds of residences. Kilgore

allegedly obtained methyl parathion at a flea market in Louisiana, although the actual source has never been identified. Kilgore also sold or gave diluted methyl parathion to several persons in Lorain County, one of whom in turn passed the diluted methyl parathion solutions to friends and family in Winchester, Tennessee; and Buffalo, New York.

The investigation and remediation efforts took 18 months to complete. The interagency effort involved the environmental sampling of 800+ homes by the Ohio Department of Agriculture, EPA Region 5, Ohio Environmental Protection Agency, Lorain County Health Department, Lorain City Health Department, and Elyria Health Department. Biological testing of 500 individuals was conducted by the Center for Disease Control and the Lorain County Health Department. The decontamination and restoration of 232 homes to habitable conditions was performed by the EPA Superfund program. The cost of the response was more than \$20 million. Kilgore was sentenced to 3 to 5 years on multiple state felony charges. Kilgore was also indicted and convicted on federal charges. He served time in a federal penitentiary.

At the time of the investigation, there was very little, if any, information regarding methyl parathion exposure to humans in an urban environment. As a result, the Lorain County investigation demanded groundbreaking development of protocols, procedures, and practices regarding sampling and analysis, toxicity and clean-up rankings, and laboratory procedures. These efforts in Lorain County have saved agencies involved in subsequent investigations literally millions of dollars and significantly reduced response and cleanup times.

4.2 Wayne County, Michigan

Less than a year later in April 1995, a similar incident was discovered in Detroit, Michigan. The Detroit incident involved two different businesses – Morning Glory Soap Products and Hudson’s Pest Control. Hudson’s was a licensed commercial applicator; Morning Glory was a registered pesticide producing establishment. Both businesses were located in economically depressed communities. Susan Hudson of Hudson’s Pest Control was found to have mixed methyl parathion with other pesticide active ingredients and sold the resulting product to the public. Hudson allegedly sprayed diluted methyl parathion for roach control in the course of her family business. Morning Glory was found adding (spiking) methyl parathion to an EPA-registered insecticide produced at the site and then selling the spiked material over the counter to the general public. Analyses of these products confirmed the presence of both methyl parathion and ethyl parathion. The source of the methyl parathion and ethyl parathion was never identified, though EPA suspects that the methyl parathion was diverted from the cotton belt of the United States.

Based on empty container purchases, it was estimated that thousands of these roach killer products were sold by Hudson and Morning Glory. However, after the environmental testing of 140 residences, only four residences, including a neighborhood homeless mission, required

decontamination and restoration. Approximately \$1 million was spent in the evaluation of the risk and the remediation efforts.

5. Major Findings

The purpose of this case study was to collect information through research and personal interviews with government employees to identify deficiencies that allowed the methyl parathion illegal use described. Specifically, the purpose of this section is to identify:

- Deficiencies in regulatory, enforcement, and outreach programs that contributed to the investigations.
- Effectiveness of any changes already implemented and suggestions for improvement.

The following subsections address each of these specific areas.

5.1 Deficiencies in Regulatory, Enforcement, and Outreach Programs

While the exact reasons for the methyl parathion illegal use in Ohio and Michigan have never been fully determined, many of the individuals interviewed believed there are deficiencies in various aspects of the pesticide regulatory system that contributed or made the illegal use possible. Specifically, those deficiencies have been categorized into three distinct areas, which are discussed in the following subsections:

- Statutory / regulatory implementation
- Enforcement
- Outreach / education.

Before discussing those specific deficiencies, it should be noted that the majority of individuals interviewed for this case study believed the major contributor to the investigations was human nature. That is, people will always find ways to get around the laws as long as there is benefit to someone. Almost everyone interviewed believed there is an “underground” market for methyl parathion and other similar pesticides that cannot easily be controlled. The mere fact that a pesticide is restricted (more toxic) makes it more valuable in an illegal market, especially if it has been identified as a problem-solver, like methyl parathion.

Statutory / Regulatory Implementation

One deficiency identified focused on the requirements for certification of pesticide applicators. As mentioned previously, FIFRA is the primary statute regulating the manufacture, sale, and use of pesticides. Since certain FIFRA authorities are delegated programs (e.g., Section 11 of the

Act), almost every state in the country has responsibility for implementing some aspect of FIFRA and its regulations, meaning that each individual state is able to develop and implement a unique program as long as it is, at a minimum, “functionally equivalent” to the federal requirements. It is this “state responsibility” that many individuals identified as one of the major deficiencies with the statute, especially in terms of certifying pesticide applicators.

Based on the individual impressions gleaned from the personal interviews, one deficiency, as well as a contributing factor to both investigations, appears to be problems with the requirements for certification of pesticide applicators. Interviewees from the two states believe Ohio and Michigan have two of the most stringent certification programs in the country. However those same individuals believe that in other states, especially the southern states, the certification standards for pesticide applicators, although they meet federal requirements, are too lax and do not require the proper degree of education and training. These lax standards and lack of training translate to individuals getting their hands on restricted use pesticides who should not have them and who are likely to misuse these pesticides or distribute them illegally. Individuals from both the Ohio and Michigan regulatory agencies believe certification programs should be modified to include more stringent requirements. More stringent requirements will either filter out those who should not be dealing with the pesticide in the first place, as well as educate competent applicators on the seriousness of RUP pesticides and the regulations governing their use.

Another statutory / regulatory deficiency is the lack of an adequate tracking mechanism for pesticides in commerce. Individuals at every level of government – federal, state, and local – agreed that the tracking of pesticides works well in regard to the manufacturer and the first level distributor, but after that there is no system in place to continue tracking the pesticide. That is, the statute requires tracking and recordkeeping from registrant to the distributor, but no additional tracking / recordkeeping is required during subsequent levels of distribution (e.g., distributor to dealer, dealer to user). Required recordkeeping at the lower levels of distribution could impact an individual’s ability to get the pesticide by placing more controls on the distributor to only sell the product to licensed applicators and not divert it.

Most interviewees felt the regulatory requirements should be changed to mandate tracking pesticides from the distributors to the ultimate end users. For example, Michigan maintains a monthly sales register that tracks who bought a restricted use pesticide, in what quantities, and for what use. Most states do not track sales to this level. Developing a tracking system would introduce more accountability into the system and would allow for tracking at every level of distribution. Individuals who were required to keep records and report such records may not risk illegal distribution and also would know they had to track every drop. For example, the registrant has to track every sale of an RUP, likewise for each distributor and dealer on down the line.

Enforcement

From an enforcement perspective, both EPA and the states can initiate civil and criminal enforcement actions under their respective authorities. FIFRA identifies specific “unlawful acts” and resulting penalties (both civil and criminal). Many individuals, especially at the state level, believe the enforcement component of FIFRA, as well as the state statutes, is not nearly strong enough and needs to be more punitive for severe violations. The Ohio case resulted in a jail term of only 30 days. Similarly, the violations in Michigan resulted only in fees, revocation of licenses, and community service. Because of this perceived deficiency, even when individuals are prosecuted and convicted, the sentence does nothing to deter future violations. Those same individuals also believe the state statutes should be more strong and punitive for severe violations.

From a criminal case perspective, there is a perceived deficiency by state and local individuals regarding federal prosecution. While relationships between state and federal individuals working the criminal cases were, at best, strained, the deficiency is the time it takes to get a case to trial and judgement. In the Ohio case, it took nearly 2 years for the case to get to trial. In Michigan, individuals from the state did not even know what became of the federal criminal case. This delay in judgement severely weakened any deterrence that may have come from the prosecution. Not only did it significantly dampen the morale of those working the case and those involved in the prosecution, but it also sent the message that the case is not important and, thus, the violation and act were not important or serious. All of these characteristics, according to the individuals interviewed, make a “mockery of the violations”, make the “government look foolish,” and present “absolutely no deterrent” to future violations. U.S. attorneys’ offices need to aggressively pursue environmental crimes. These offices need to be well informed of the issues by EPA, state lead agencies, and community health organizations.

Some individuals believe the statutes are sufficient at both the federal and state levels, but that the number of staff and the training for inspectors, case development officers, and other enforcement program staff is deficient. This lack of training and proper tools severely handicaps a regulatory agency’s ability to detect and deter investigations such as those that occurred in Ohio and Michigan. As an example, local health inspectors were actually referring Kilgore to residents because he seemed to be the only exterminator who could get rid of the roaches. A more thorough understanding of pest control problems, as well as pesticides, may have raised the health inspectors’ awareness regarding the fact that Kilgore was the only “exterminator” who could solve the roach problem. Currently, local health department personnel receive little or no training regarding FIFRA or pesticide safety.

Outreach / Education

Another deficiency that may have contributed to the misuse investigations in Ohio and Michigan was the basic lack of outreach to both the public and the regulated urban community. In both the Ohio and Michigan investigations, the majority of the outreach and education activities were conducted after the fact. Prior to the investigations, there was very little, if any, outreach to the

urban community regarding the use of pesticides and pesticide applicators. At the local level, housing or health inspectors may have discussed pesticides during health inspections, but that was the extent of the outreach. Many interviewed believed that even if there had been outreach conducted, it still would not have mattered because the methyl parathion solved the roach problems. It was the only solution, other than a change in lifestyle, that would have these results.

There was also very little outreach to the regulated urban community regarding restricted use pesticides and certification requirements. In addition, in Ohio, relationships between the regulated community and the regulatory agency were virtually non-existent, as witnessed by the fact that others in the pest control industry knew about Kilgore but did not report him.

This lack of outreach may have contributed to the problems in that people did not know any better. They were unaware that pest control applicators were supposed to be licensed and that methyl parathion was a dangerous pesticide. All they knew was that the substance worked very well, they were getting recommendations from friends, and they were getting it from what they perceived to be legitimate businesses.

5.2 Effectiveness of Changes Already Implemented

As a result of the Ohio and Michigan investigations, a variety of regulatory and programmatic changes have been developed and implemented at the federal, state, and local levels. These changes were made to address the potential causes of the investigations and to hopefully prevent future investigations. The specific areas in which changes have been identified and implemented include:

- Registration amendments of methyl parathion
- Enforcement
- Outreach / education programs
- Local ordinances
- Agency initiatives

Since many of these changes have been recently implemented, it is difficult to measure their overall effectiveness; however, the following sections describe the changes and present the interviewees' perceptions of the effectiveness of the changes.

Registration of Methyl Parathion

Based on past investigations, all registrants of methyl parathion were party to an agreement that changed the packaging, formulation, and labeling of their products to further prevent illegal diversion to indoor use. In addition to recalling all unopened containers of certain end-use products, specific changes to the product included:

- Packaging products in larger, returnable, refillable containers with a tamper-resistant mechanism
- Placing a unique identification number that will remain on the label at all times to facilitate tracking in the distribution chain
- Adding a stenching agent

While most felt it was too early to tell if these changes are helping, many felt there were other options that may have been better. Many believe adding a staining agent (e.g., purple dye) would work better, because methyl parathion already has a stench and it did not appear to stop people from having it sprayed in their houses. Also, many people associate the smell with efficacy. (If I can smell it, it's working.) A staining agent would result in a lasting effect that may deter people from using it, or at least using it as much and in certain places. The container and labeling changes may also help, but people will always find a way to avoid complying with the law. Placing tracking labels and making the containers more difficult to deal with will probably not deter the problem significantly.

Enforcement

Since the methyl parathion investigations, the Michigan Department of Agriculture (MDA) has begun targeting inspections in “at risk” communities. The purpose of the inspections is to conduct inventory control checks. (As followup to the Hudson incident, MDA went to every business in the local area to check inventory.) In addition to increasing actual inspections, MDA is basically increasing its urban surveillance and its existing enforcement presence in economically depressed communities.

Outreach / Education

In response to the investigations, all levels of government in Ohio and Michigan began an aggressive outreach campaign designed to educate the urban public about risk of pesticide use, choosing pesticide applicators, and alternative pest control approaches. Many of the fact sheets also discuss the process for, and significance of, registering tips and complaints to authorities when illegal pesticide use is suspected. Numerous fact sheets have been developed and distributed widely to local communities through mailings and handouts and through local and state agency offices. Because of the diversity of the local communities, many of the fact sheets were translated into other languages to ensure a maximum number of residents were reached. Copies of several of these fact sheets are included as Appendix C.

As part of the outreach / education program, the regulatory agencies in both Ohio and Michigan have begun working through community groups (e.g., churches, shelters, block groups) to

distribute their message regarding the dangers associated with pesticide use. In Ohio, local housing and health inspectors increased their outreach efforts by distributing information during inspections on low-risk pest control methods. Michigan, specifically, created an Urban Pesticide Education Program and has hired a community program manager to begin working within the “at risk” communities. It is believed that should another incident occur within an urban area, the program manager will have established ties within the community and will be better able to deliver the message. In addition, Michigan convened a coalition of stakeholders (trade associations, regulatory agencies, and others) to help focus and develop outreach materials. Michigan is also conducting outreach in schools hoping the students will take the information back to their parents. If not, at least the students are being educated. Also, Michigan schools are now required to have an integrated pest management program (IPM) for each school building. These programs will not only educate individuals on IPM, but also potentially save the school system money by reducing pest control costs.

The Ohio Department of Agriculture (ODA) admitted it had a credibility problem with the pest control industry as evidenced by the fact that several pest control companies knew about Kilgore, but did not report him. The companies did not alert ODA to this potential health risk because they did not consider him a competitive risk. To improve its credibility and to increase its visibility within the regulated community, ODA now regularly attends pest control industry annual meetings and conducts other types of outreach. By establishing ties within the regulated community, ODA is hoping that such investigations, should they occur in the future, will be identified and reported by others in the regulated community.

Local Changes

Since the incident in Ohio, Lorain City has changed one of its ordinances regarding pest control in public housing. Now, for 1- and 2-unit buildings, extermination is the responsibility of the tenant, as opposed to the landlord. The thought is that shifting the responsibility, and expense, of pest control to the tenant may encourage them to better maintain their homes, thus reducing the pest population. In addition, Lorain City also changed the language in the ordinance so it now states that pest control must be conducted by a “licensed, certified applicator.”

Agency Initiatives

Stemming from the Ohio and Michigan investigations, EPA’s Office of Enforcement and Compliance Assurance has developed and is currently implementing an initiative designed to help detect, as well as deter, urban misuse investigations. As part of this urban initiative, EPA developed a national program guidance manual that addresses the illegal use of agricultural pesticides in urban and other residential settings. The guidance describes the types of activities that are necessary to achieve the goals of the initiative, which are:

- Preventing future diversion and illegal structural application of agricultural pesticides by providing regulatory oversight and outreach to urban and other residential communities on a permanent basis.
- Identifying points of contamination from any structural application of agricultural pesticides in urban and other communities where the health risks of pesticide exposure to the affected population, particularly the very young and/or elderly subpopulations may necessitate action.
- Detecting all points of diversion of methyl parathion or other restricted use pesticides from the agricultural sector and initiating appropriate enforcement action against the culpable parties.

The outreach strategy has two components. The first component will focus on low income, primarily minority, urban communities to determine if structural application of restricted use agricultural pesticides may be occurring. In addition to pesticide use inspections, educational programs will be fostered to reach community residents who would not normally be contacted through existing programs. Routine inspections of certified structural pesticide applicators will continue with emphasis on identifying unlicensed and uncertified pest control operators. Marketplace surveillance of farmers' and flea markets at point of use communities will be conducted to detect unregistered "homemade" insect and rat poison products.

The second component focuses on the agricultural sector and uses the methyl parathion production and distribution chain as a starting point to detect possible sites of diversion of restricted use agricultural pesticides to urban and other community settings. Marketplace surveillance at local farmers' and flea markets will be conducted in addition to the routine producer / distributor / dealer establishment inspections. Outreach efforts will focus on industry, applicator, and farmer organizations soliciting assistance in identifying purchasers of agricultural pesticides who are not involved in the production of agricultural commodities.

6. Recommendations

The deficiencies identified, as well as the changes already implemented, present various opportunities for improvements or enhancements. The following are recommendations, gleaned from the interviews and research, that may address the deficiencies and further improve the changes already implemented.

Statutory/Regulatory Implementation

1. *Certification Requirements:* To prompt states to institute more stringent certification requirements, conduct a survey of selected states. Prepare a "Best (and Worst) Practices" handbook/manual. Include case study examples of Ohio and Michigan for real life

examples of how process can go astray. Distribute/make available to all levels of government (federal, state, local).

Players: EPA and state participants/workgroup; get regulated community input as well.

Barriers: Resources and, ultimately, being successful in getting states to modify programs. In most cases, such changes would require either state statutory or regulatory changes.

2. *Tracking Mechanism*: Similar to #1 above, identify states that currently implement effective tracking mechanisms, such as Michigan and California. Analyze pros and cons of each methodology.

Players: EPA and State participants/workgroup; get regulated community input as well.

Barriers: Resources and, as above, getting states to modify existing systems or implement new ones. In most cases, such changes would require either state statutory or regulatory changes.

3. *Modify FIFRA*: Based on interviewees' comments, modify FIFRA and encourage modification of state statutes to allow for more severe civil and criminal actions, based on the nature of the violation.

Players: EPA, states (congress / state legislatures)

Barriers: Process is time consuming and there will lots of opposition from the regulated community

Enforcement

1. *Expedite Process*: In the instance where there is blatant misconduct or a highly visible incident, expedite the enforcement process by providing local / state efforts with federal assistance in terms of consultation and money. Need to develop criteria for determining what defines blatant or severe.

Players: EPA, states, localities

Barriers: Perceived bias in what gets expedite

2. *National Education Programs*: Conduct federally sponsored education / training programs for inspectors at local, state, and federal level. To provide best possible information, revise inspection manual(s) on a regular basis to keep current. Cite specific states that have instituted successful programs. Use material developed above.

Players: EPA, states

Barriers: Resources

Outreach/Education

1. *Public*: Prepare a profile that will assist officials in identifying communities at risk. Develop materials that aid local officials in targeting these communities. Utilize efforts of existing organizations such as universities, non profits, etc. to distribute materials.

Players: EPA, States, local agencies and organizations.

Barriers: Conflicting ideas in what constitutes a profile of an at-risk community

2. *Regulated Community*: Consider voluntary agreements with manufacturers to further tighten the controls on distribution and tracking. Reach out to industry trade associations and other partners to fully communicate the importance of pesticide use and safety. Become more involved in industry activities and establish a presence within the industry.

Players: EPA, states, local agencies, industry, industry groups, public

Barriers: Typical differences between regulatory agencies and industry / public

Appendix A

SUMMARY OF FINDINGS

Statutory / Regulatory Findings

Federal Insecticide, Fungicide, and Rodenticide Act

- ***Certification of pesticide applicators.*** In some states, the certification standards for pesticide applicators, although they meet federal requirements, are too lax and do not require the proper degree of training. Certification programs should be modified to include more stringent requirements, such as training sessions and a written test.
- ***Tracking system.*** The current federal regulatory system only tracks pesticides during the first level of distribution. That is, it requires tracking from registrant to distributor, but no additional tracking is required during subsequent levels of distribution (e.g., distributor to dealer, dealer to user). The system should be changed to track pesticides from the distributors to the ultimate end users. For example, Michigan maintains a monthly sales register that tracks who bought a restricted-use pesticide, in what quantities, and for what use. Most states do not track sales to this level.

In addition, the registrant should take more responsibility and accountability. There is currently a program in California that provides an example of registrant responsibility and accountability. The program requires that the registrant take accountability for every drop or container it sells.

- ***Enforcement.*** FIFRA, as well as state statutes, need to contain a stronger enforcement component and needs to be more punitive for severe violations. Not only FIFRA, but state statutes, also. The Ohio case, which was for a felony, resulted in a jail term of only 30 days. Similarly, the violations in Michigan, which were only tried as misdemeanors,

resulted only in fees and community service. Currently, neither FIFRA nor state statutes take the danger of the act into consideration.

The criminal activities associated with the MP incidents needed better coordination between the federal government and the states. There was a feeling on the part of the states that the federal criminal investigators did not cooperate fully and share information on the cases. Information sharing appeared to flow only from state to federal. Also, there was concern at the state level that the long delay in federal prosecution presents no deterrent to future violations.

- ***Effects of recent registration changes for MP.*** It is too early to tell if the January 1997 registration changes to MP are helping. Many believe a staining agent should be added to MP because it already has a stench. In addition, many people associate a stench with efficacy. Other changes, such as the labeling and packaging, may deter illegal purchases.

Other Statutory / Regulatory Issues

- ***Relocation.*** Currently, there are various regulations regarding relocation (Department of Transportation, Federal Emergency Management Agency, U.S. Army Corps of Engineers). However, it appears these do not address situations such as temporary relocation or replacement value for property. EPA was uncertain if any of the existing regulations were binding on them or not. In addition, they would not have worked in the MP situations.

Other issues regarding relocation are not necessarily addressed through statutes or regulations, but must be addressed. One of the major issues involved paying per diem to affected citizens. Initially, the per diem was paid out in cash because most of the affected residents did not have checking or bank accounts. This resulted in the money being spent quickly by the residents. EPA also had to address other issues regarding building codes, probate issues, safety/security, and waivers for replacement furnishings (e.g., replacement stove malfunctioning and burning down the house).

- ***Privacy.*** There were privacy implications associated with the incidents and residents. The issues concerned the names and addresses of those residents tested and relocated, as well as the results of biological samples.

Local Ordinances

- ***Lorain City, Ohio.*** In Ohio, federal, state, nor county governments had ordinances to condemn homes and force people to relocate, even temporarily. (Lorain City did have a local ordinance and was able to force remove people.) Local officials had difficulty

because EPA was instructing them to remove people from their homes, but Elyria City and Lorain County did not have the legal basis to do this.

Since the incident, Lorain City has changed one of its ordinances regarding pest control in public housing. Now, for 1- and 2-unit buildings, extermination is the responsibility of the tenant, as opposed to the landlord. The thought is that this responsibility may encourage the tenant to clean their houses to help reduce the pest problem.

Programmatic Findings

- ***Relationship with Industry.*** Ohio Department of Agriculture (ODA) had a credibility problem with the pest control industry as evidenced by the fact that several pest control companies knew about Kilgore, but did not report him. The companies did alert ODA to this potential health risk because they did not consider him a competitive risk. To improve its credibility and be in contact with industry, ODA now regularly attends pest control industry annual meetings and conducts other outreach.
- ***Training.*** Training for pesticide inspectors and case developers is poor, as are state procedure manuals. While the laws are acceptable, people do not understand how to use the laws and regulations or how to enforce them.
- ***Laboratory Capability.*** Most state labs are not set up to handle large quantities of samples and specialized testing, as required for the MP incidents. It requires specialized equipment and supplies, which are expensive and sometimes difficult to obtain. In addition, a large amount of the evidence (e.g., unused pesticide, sprayers, samples) that was collected was considered hazardous and had to be handled and stored as such. For the most part, laboratory support is still inadequate for both environmental and biological sampling.

It would be helpful to involve lab personnel earlier in the process. Other staff make decisions that impact lab personnel and operations and do not consult lab staff prior to making those decisions. May be helpful to educate lab staff on field activities, and vice versa, so each knows what the other is doing and how their roles mesh.

- ***Data management.*** The MP incidents created the need for a data management system, not only for environmental and health data, but for names, addresses, and relocation sites for affected residents. In Ohio, the state health department was initially responsible for managing data, but did not do it to other's expectations. As a result, Region 5, ODA, and the local departments of health all maintained their own systems.

- ***Flexibility / Knowledge of various players.*** When the Superfund program first got involved, there was concern on the part of the state and local agencies because the Superfund process was so inflexible. For example, Superfund was not willing to accept any of the existing monitoring data from ODA. Superfund had its standard operating procedures (SOPs) to follow and did so at the befuddlement of the other parties. Region 5 acted as facilitator and was able to smooth over many of the rough relationships that developed. Education early in the process as to the roles and responsibilities of all players, especially Superfund, would be helpful.
- ***Grant issues.*** The grant between Ohio and Region 5 had to be addressed because, due to the Lorain County incident, Ohio was not going to be able to meet its commitments for the year. Region 5 basically waived the grant agreement and allowed Ohio to continue with the investigation. It did not have to deobligate money and then reobligate it to the investigation.
- ***HQ relationships.*** On some issues, such as relocation, Headquarters provided valuable support to the project. However, other issues requiring the attention of the Office of Pesticide Programs, including the Registration Division, were not addressed as adequately. It appeared that OPP would not lend support early on because it would not acknowledge that MP was the problem.
- ***Response plan.*** Based on the incidents that have occurred, EPA or the states should consider developing a response plan should such an incident occur again. Michigan stated it would work through its emergency response system next time.
- Testing EPA/state/local personnel. All individuals associated with sampling at the site were initially given baseline samples. However, as for follow up, Superfund fully tested its people; but ODA never received any follow-up testing.
- ***Laboratory Certification / Verification.*** Initially, there were no SOPs or protocols for the labs to follow. ODA spent significant time and resources developing these tools. Since the NEIC labs are no longer in existence, someone needs to examine the methods for MP. There is also a need for a lab QA verification process and certification program that is accepted by everyone.
- ***Local education.*** Federal and state staff had no knowledge of local culture. Lorain and Elyria City health departments were able to educate them regarding habits and culture of affected residents (e.g., how the people lived, what time staff should start work in the morning, what time to stop work in the evening, etc.) Many of the residents lived in public housing and relied on landlords for pest control. Some had limited trash removal.

- ***Sensitivity to local situations.*** EPA must understand that the local health departments do not have the same capabilities and resources and are not able to do things immediately (if at all). Not many of the resources ever filtered down to the local levels.
- ***Understanding of local jurisdictions.*** When dealing with local agencies, EPA must recognize the structure and jurisdictional boundaries. For example, in Ohio, the county did not have jurisdiction over the cities. In fact, the cities had more legal basis than the county for dealing with the incident.
- ***Media relations.*** Newspapers were a valuable resource, both in terms of identifying homes that were exposed to MP and in spreading legitimate information about the health effects of MP. Local officials met with newspaper editors immediately and told them they needed their help, but did not want to create a panic. This preemptive strike with the media was critical to the success of the outreach program.
- ***Outreach.*** Much outreach was conducted during and after both incidents. However, the results or effects of the outreach are still unknown. Outreach on IPM and lifestyle changes, in many cases, were not well received by community. Residents did not want people, especially the government, telling them to change their current lifestyle (e.g., clean homes, take out trash, etc.)

There was a basic distrust of government. Local residents were concerned about providing biological samples or having government staff in their homes. In response, many believed conducting outreach through community groups (e.g., churches, shelters, block groups) is the only way to reach the community. Michigan is conducting outreach in schools hoping the students will take the information back to their parents. If not, at least the students are being educated.

In response to the MP incident, Michigan hired a community program manager to begin working within the “at-risk” communities. It is believed that should another incident occur within an urban area, the program manager will have established ties within the community and will be better able to deliver the message. In addition, Michigan convened a coalition of stakeholders (trade associations, regulatory agencies, and others) to help focus and develop outreach materials.

Outreach materials may need to be translated into a variety of languages, depending on where the incident occurs.

Appendix B

E X T O X N E T

Extension Toxicology Network

A Pesticide Information Project of Cooperative Extension Offices of Cornell University, Michigan State University, Oregon State University, and University of California at Davis. Major support and funding was provided by the USDA/Extension Service/National Agricultural Pesticide Impact Assessment Program.

Pesticide
Information
Profile

Methyl Parathion

TRADE OR OTHER NAMES

Alternate common names are parathion-methyl and and metafos (3). Trade names include Bladan M, Cekumethion, Dalf, Dimethyl Parathion, Devithion, E 601, Folidol-M, Fosferno M50, Gearphos, Kilex Parathion, Metacide, Metaphos, Metron, Nitrox 80, Partron M, Penncap-M, Tekwaisa.

REGULATORY STATUS

Some or all applications of methyl parathion may be classified as Restricted Use Pesticides (RUP) by EPA (3). RUPs may be purchased and used only by certified applicators. Products containing methyl parathion must bear the signal word "Danger" (3). No worker may enter a field treated with methyl parathion within 48 hours of treatment (EPA 1980).

INTRODUCTION

Methyl parathion is an insecticide and acaricide used to control boll weevils and many biting or sucking insect pests of agricultural crops (3). It kills insects by contact, stomach and respiratory action. Methyl parathion is available in dust, emulsifiable concentrate, ULV liquid, microencapsules and wettable powder formulations (3).

Methyl parathion is one of a class of insecticides referred to as organophosphates. These chemicals act by interfering with the activities of cholinesterase, an enzyme that is essential for the proper working of the nervous systems of humans, animals and insects. Please refer to the Toxicology Information Brief on cholinesterase-inhibition for a more detailed description of this topic.

TOXICOLOGICAL EFFECTS

ACUTE TOXICITY

Methyl parathion is highly toxic by inhalation and ingestion, and moderately toxic by dermal adsorption (9). As with all organophosphates, methyl parathion is readily absorbed through the skin. Skin which has come in contact with this material should be washed immediately with soap and water and all

contaminated clothing should be removed. Accidental skin and inhalation exposure to methyl parathion have caused human fatalities. Methyl parathion may cause contact burns to the skin or eyes (13).

Because methyl parathion has a short half-life (1 hour on cotton) when applied to crops, the risk of exposure to agricultural workers is low. Factory workers who handle quantities of concentrated methyl parathion are at a higher risk (2). Exposure may occur during mixing, spraying or application of methyl parathion, during cleaning and repair of equipment or during early re-entry into fields (20). Persons with respiratory ailments, recent exposure to cholinesterase inhibitors, cholinesterase impairment, or liver malfunction are at increased risk from exposure to methyl parathion. High environmental temperatures or exposure of the chemical to visible or UV light may increase its toxicity (9).

The organophosphate insecticides are cholinesterase inhibitors. They are highly toxic by all routes of exposure. When inhaled, the first effects are usually respiratory and may include bloody or runny nose, coughing, chest discomfort, difficult or short breath, and wheezing due to constriction or excess fluid in the bronchial tubes. Skin contact with organophosphates may cause localized sweating and involuntary muscle contractions. Eye contact will cause pain, bleeding, tears, pupil constriction, and blurred vision. Following exposure by any route, other systemic effects may begin within a few minutes or be delayed for up to 12 hours. These may include pallor, nausea, vomiting, diarrhea, abdominal cramps, headache, dizziness, eye pain, blurred vision, constriction or dilation of the eye pupils, tears, salivation, sweating, and confusion. Severe poisoning will affect the central nervous system, producing incoordination, slurred speech, loss of reflexes, weakness, fatigue, involuntary muscle contractions, twitching, tremors of the tongue or eyelids, and eventually paralysis of the body extremities and the respiratory muscles. In severe cases there may also be involuntary defecation or urination, psychosis, irregular heart beats, unconsciousness, convulsions and coma. Death may be caused by respiratory failure or cardiac arrest (9).

Some organophosphates may cause delayed symptoms beginning 1 to 4 weeks after an acute exposure which may or may not have produced immediate symptoms. In such cases, numbness, tingling, weakness and cramping may appear in the lower limbs and progress to incoordination and paralysis. Improvement may occur over months or years, but some residual impairment will remain (9).

The amount of a chemical that is lethal to one-half (50%) of experimental animals fed the material is referred to as its acute oral lethal dose fifty, or LD50. The oral LD50 for methyl parathion in rats is 18 to 50 mg/kg, in mice is 14.5 to 19.5 mg/kg, in rabbits is 420 mg/kg, in guinea pigs is 1270 mg/kg, and in dogs is 90 mg/kg (2, 3, 9). The dermal LD50 in rats is 63 to 491 mg/kg, in mice is 1200 mg/kg, and in rabbits is 300 mg/kg (3, 9).

The lethal concentration fifty, or LC50, is that concentration of a chemical in air or water that kills half of the experimental animals exposed to it for a set time period. The 4-hour inhalation LC50 for methyl parathion in rats is 34 mg/m³, and in mice is 120 mg/m³ (9).

CHRONIC TOXICITY

Repeated or prolonged exposure to organophosphates may result in the same effects as acute exposure including the delayed symptoms. Other effects reported in workers repeatedly exposed include impaired memory and concentration, disorientation, severe depressions, irritability, confusion, headache, speech difficulties, delayed reaction times, nightmares, sleepwalking and drowsiness or insomnia. An influenza-like condition with headache, nausea, weakness, loss of appetite, and malaise has also been reported (9).

Studies with human volunteers have found that 1 to 22 mg/person/day have no effect on cholinesterase activity. In a 4-week study of volunteers given 22, 24, 26, 28 or 30 mg/person/day, mild cholinesterase inhibition appeared in some individuals in the 24, 26 and 28 mg dosage groups. In the 30 mg/person/day (about 0.43 mg/kg/day) group, red blood cholinesterase activity was depressed by 37%. When methyl parathion was fed to dogs for 12 weeks, a dietary level of 1.25 mg/kg soon caused a significant depression of red blood cell and plasma cholinesterase. A dietary level of 0.125 mg/kg produced no effects (2).

The EPA has established a Lifetime Health Advisory (LHA) level of 60 micrograms per liter (ug/l) for 4-nitrophenol, a breakdown product of methyl parathion, in drinking water. This means that EPA believes that water containing 4-nitrophenol at or below this level is acceptable for drinking every day over the course of one's lifetime, and does not pose any health concerns. However, consumption of 4-nitrophenol at high levels well above the LHA level over a long period of time has been shown to cause adverse health effects, including damage to the liver, respiratory stress, and inflammation of the stomach in animal studies (11).

Reproductive Effects

In a 3-generation study with rats fed dietary levels of 0, 0.5, or 1.5 mg/kg/day, there was reduced weanling survival, reduced weanling weights, and an increase in the number of stillbirths at the 1.5 mg/kg. Some of these effects also occurred at the 0.5 mg/kg dosage level. In rats and mice, a single injection of LD50 rates during pregnancy caused suppression of fetal growth and bone formation in the offspring that survived. These injections also caused high fetal mortality. The rats had been injected with 25 mg/kg on day 12 of pregnancy, and the mice were injected with 60 mg/kg on day 10. In another study, there were no adverse effects observed in the offspring of rats given oral doses of 4 or 6 mg/kg on day 9 or 15 of pregnancy (2). Once in the bloodstream, methyl parathion may cross the placenta (9). Large doses of methyl parathion injected into pregnant rats and mice reduced litter size and survival of offspring (6).

Teratogenic Effects

Methyl parathion is a possible human teratogen (14).

Mutagenic Effects

No signs of mutagenicity were seen in mice given dosages of 5 to 100 mg/kg, nor in mice fed methyl parathion for 7 weeks (2). No mutagenic changes were seen when cell cultures were grown from factory workers who had been exposed to low levels of methyl parathion for very long periods of time (15, Mut. Res. 103 (1):71-76. 1982). Other research has shown mutations to occur in cells exposed to methyl parathion (Mut. Res. 102 (1):89-102. 1982).

Carcinogenic Effects

Methyl parathion is not a suspected carcinogen (20, 21).

Organ Toxicity

Methyl parathion primarily affects the nervous system through inhibition of cholinesterase, an enzyme required for proper nerve functioning (9).

Consumption of 4-nitrophenol, a breakdown product of methyl parathion, at high levels well above the Lifetime Health Advisory level of 60 ug/l over a long period of time has been shown to cause adverse health effects, including damage to the liver, respiratory stress, and inflammation of the stomach in animal studies ([11](#)).

Fate in Humans and Animals

Methyl parathion is rapidly absorbed into the bloodstream through all normal routes of exposure. Following administration of a single oral dose, the highest concentration of methyl parathion in body tissues occurred within 1 to 2 hours ([2](#)). Metabolism occurs in the liver, eventually to phenols which can be detected in the urine([14](#)). Methyl parathion does not accumulate in the body. It is almost completely excreted through the kidneys (urine) within 24 hours ([8](#)).

ECOLOGICAL EFFECTS

Effects on Birds

A number of studies indicate that birds are highly tolerant of the effects of methyl parathion (NRC Drinking Water and Health 1977).

Effects on Aquatic Organisms

Methyl parathion is toxic to fish and to animals which eat fish ([8](#)). Other studies, however, indicate that fish kills may be caused by the following series of events. Methyl parathion kills insects and crustaceans (i.e. crayfish) which feed on algae. When these organisms are killed, algal populations rapidly "bloom," consuming all available oxygen in the pond water. It may be the lack of oxygen which kills fish (Ecotoxicol. Environ. Safety 8 (5):482-495. 1984).

Effects on Other Animals (Nontarget species)

Methyl parathion is moderately toxic to mammals such as rats, dogs and rabbits ([8](#)).

ENVIRONMENTAL FATE

Methyl parathion is rapidly metabolized by both plants and animals and it is not expected to persist or bioconcentrate ([7](#)).

Breakdown of Chemical in Soil and Groundwater

In most situations, methyl parathion adsorbs to soil particles and degrades rapidly. It is therefore unlikely to contaminate groundwater ([3](#), [4](#), [7](#)) and has rarely been detected in groundwater outside of areas where it is used on farms. It has been detected in the groundwater of Mississippi at 8 ppb ([12](#)). When it is applied as an insecticide, methyl parathion breaks down within several months, primarily by photolysis and biodegradation. The rate of degradation increases with temperature and with exposure to sunlight. Its biodegradation half-life in soil is 10 days to 2 months. Degradation was faster in flooded soils than in non-flooded soils. Mineralization may occur, especially in moist soils. Some volatilization of applied methyl parathion may occur. When large concentrations of methyl parathion reach the soil, as in an

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For more information relative to pesticides and their use,
please contact the PMEP staff at:

5123 Comstock Hall
Cornell University
Ithaca, New York 14853-0901
(607)-255-1866

Last Modified: 10/19/2000

Questions regarding the development of this web site should be directed to the [PMEP Webmaster](#).

Disclaimer: Please read the pesticide label prior to use. The information contained at this web site is not a substitute for a pesticide label. Trade names used herein are for convenience only. No endorsement of products is intended, nor is criticism of unnamed products implied.

accidental spill, degradation will occur only after many years, with photolysis being the dominant route (7). It is unlikely that methyl parathion will run-off into surface waters (J. Environ. Qual. 9:665-672. 1980). 4-Nitrophenol is an insecticide and a break down product of methyl parathion. It may have been detected at very low levels by EPA during a national survey of drinking water wells. EPA is uncertain and cannot quantify the amount or frequency of 4-nitrophenol in drinking water wells, because the tests used to detect the presence of 4-nitrophenol are not reliable for measuring concentrations of this material in water. However, 4-nitrophenol does not adsorb to soil particles and may contaminate groundwater (11).

Breakdown of Chemical in Water

Methyl parathion degrades rapidly in seawater, lake, and river waters, with 100% degradation occurring within 2 weeks to 1 month or more. Degradation is faster in the presence of sediments, and is faster in fresh water than in salt water. Mineralization occurs at a rate of 5 to 11% in 4 days in rivers, and more slowly in marine waters. In water, methyl parathion is subject to photolysis, with a half-life of 8 days during the summer and 38 days in winter (7).

Breakdown of Chemical in Vegetation

Uptake and metabolism of methyl parathion in plants is fairly rapid. Four days after applying methyl parathion to the leaves of corn, it was almost completely metabolized (7).

PHYSICAL PROPERTIES AND GUIDELINES

Pure methyl parathion is a white crystalline solid with a characteristic odor of rotten eggs or garlic. Technical product is light to dark tan with about 80% purity (2). Methyl parathion is hydrolyzed by, and therefore not compatible with, alkaline materials. It may react with strong oxidizers. Methyl parathion should not be heated above 55 degrees C. It decomposes rapidly above 100 degrees C, creating an explosion hazard. Thermal decomposition may release toxic fumes of dimethyl sulfide, sulfur dioxide, carbon monoxide, carbon dioxide, phosphorus pentoxide, and nitrogen oxides (3, 9).

The National Fire Protection Agency ratings for methyl parathion include:

- A. health: 4 = a few whiffs of the fumes could prove fatal; normal fire fighting gear is inadequate to protect against any exposure to the skin.
- B. flammability: 1 = solids which must be preheated to burn; 3 = liquids which when burning can not be extinguished with water (in fact water may be dangerous to use). Dusts may create flash fires.
- C. reactivity: 2 = normally unstable materials which will react violently (with water). Are potentially explosive when mixed with water (18).

Methyl parathion will react violently with oxidizing agents (16). It may explode upon heating. The temperature around containers of methyl parathion should not exceed 25-30 degrees C (75-85 degrees F) (1).

Contaminated clothing is best thrown away. It takes many washings to bring the level of methyl parathion down to non-hazardous levels (Bull. Envir. Contam. Tox. 27:518-523; 29:461-468. 1982).

Exposure Guidelines:

0.2 mg/m³ OSHA TWA (skin) ([9](#))

0.2 mg/m³ ACGIH TWA (skin) ([9](#))

0.2 mg/m³ NIOSH Recommended TWA (skin) ([9](#))

Physical Properties:

CAS #: 298-00-0

Specific gravity: 1.20 - 1.36 at 20 degrees C ([2](#), [3](#))

H₂O solubility: 55 - 60 mg/l at 20 degrees C ([3](#))

Solubility in other solvents: Soluble in dichloromethane, 2-propanol, toluene, and most organic solvents.
Slightly soluble in aliphatic hydrocarbons, and in light petroleum and mineral oils. Nearly insoluble in n-hexane ([2](#), [3](#), [9](#)).

Melting point: 35 - 36 degrees C (97 degrees F) ([3](#), [9](#))

Boiling point: 143 degrees C ([7](#)); 228 degrees F (109 degrees C) at 0.05 mm Hg ([9](#))

Decomposition temperature: 100 degrees C ([9](#))

Flashpoint: 42 degrees C ([3](#))

Vapor pressure: 0.97 x 10 to the minus 5 mm Hg at 20 degrees C ([2](#))

K_{oc}: 5100 g/ml ([4](#))

Chemical Class/Use: Organophosphate insecticide

BASIC MANUFACTURER

Cheminova Agro A/S
P.O. Box 9
DK-7620 Lemvig Denmark
Telephone: 45-9-783-4100

Review by Basic Manufacturer:

Comments solicited: October, 1992

Comments received: January, 1994

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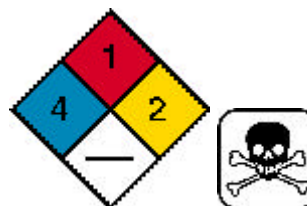
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**ToxFAQs**

Methyl Parathion

[CAS# 298-00-0](#)

September 1995

Methyl Parathion $C_8H_{10}NO_5PS$ [Stereo Image](#)[XYZ File](#)[NFPA Label Key](#)

Agency for Toxic Substances and Disease Registry

This fact sheet answers the most frequently asked health questions about methyl parathion. For more information, you may call the ATSDR Information Center at 1-800-447-1544. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: The general population is probably not exposed to methyl parathion. However, exposure to methyl parathion may occur at farms where it has been sprayed. Methyl parathion is a powerful poison that affects the central nervous system. This chemical has been found in at least 16 of 1,416 National Priorities List sites identified by the Environmental Protection Agency.

What is methyl parathion? **(Pronounced meth'el para-thi'on)**

Methyl parathion is an insecticide that comes in two forms, white crystals or a brownish liquid. It smells like rotten eggs and is similar to nerve gas.

It has been made in the United States since 1952. Methyl parathion is used to kill insects on farm crops,

especially cotton. It is a restricted-use pesticide. This means that only trained people are allowed to mix, load, and spray it.

What happens to methyl parathion when it enters the environment?

- Methyl parathion enters the environment primarily through spraying on farm crops.
- Methyl parathion is rapidly broken down to other chemicals in water and soil.
- Fish do not appear to take in and store methyl parathion from the water.

How might I be exposed to methyl parathion?

- Most people are not exposed to methyl parathion.
- Exposure is most likely for those people living or working near or on a farm where methyl parathion is sprayed on crops.
- Farm workers, pesticide sprayers, or people in factories that make methyl parathion may also be exposed to it.
- Methyl parathion has been detected at very low levels in food.

How can methyl parathion affect my health?

Methyl parathion is a poisonous chemical that affects the central nervous system. Exposure to very high levels for a short time in the air or water may cause loss of consciousness, dizziness, confusion, headaches, difficulty breathing, chest tightness, blurred vision, sweating, and even death.

Changes in mental state may last several months after exposure to high levels of methyl parathion has ended.

It is not known whether exposure to low levels affects people's health. Animal studies have shown effects on the central nervous system, decreased heart rate and blood pressure, and a reduced ability of the animals to fight infection from long-term ingestion exposure to methyl parathion.

How likely is methyl parathion to cause cancer?

The International Agency for Research on Cancer has determined that methyl parathion is not classifiable as to its carcinogenicity to humans.

No studies are available on carcinogenic effects in people, and cancer was not found after exposure of rats and mice to methyl parathion in the diet.

Is there a medical test to show whether I've been exposed to methyl parathion?

There are several medical tests available to determine whether you have been exposed to methyl parathion. The first test measures methyl parathion in the blood or measures p-nitrophenol, a breakdown product of methyl parathion, in the urine. This test is only reliable for about 24 hours after you are exposed, because methyl parathion breaks down quickly and leaves the body.

The second test measures the levels of a substance called cholinesterase in the blood. If cholinesterase levels are less than half what they should be and you have been exposed to methyl parathion, you may get symptoms of poisoning.

Cholinesterase levels in red blood cells can stay low for more than a month after you have been exposed to methyl parathion.

Has the federal government made recommendations to protect human health?

The Environmental Protection Agency (EPA) allows no more than 0.1 to 5.0 parts of methyl parathion in 1 million parts of raw farm products (0.1-5 ppm), such as fruits, vegetables, or animal food.

The EPA has recommended guidelines for exposure to methyl parathion in drinking water. They recommend that exposures in children should not exceed 0.3 milligrams per liter (mg/L) for 1- to 10-day periods or no more than 0.03 mg/L for longer periods (7 years). Adults should not be exposed to more than 0.002 mg/L for a lifetime.

The EPA requires that discharges or accidental spills of 100 pounds or more of methyl parathion into the environment be reported.

The National Institute for Occupational Safety and Health (NIOSH) recommends an occupational exposure limit of 0.2 milligrams of methyl parathion in a cubic meter of air (0.2 mg/m³) for an 8-hour workday over a 40-hour workweek.

The American Conference of Governmental Industrial Hygienists (ACGIH) has established the same guidelines as NIOSH for the workplace.

Glossary

Carcinogenicity:

Ability to cause cancer.

Cholinesterase:

An enzyme found in blood.

Ingesting:

Taking food or drink into your body.

Insecticide:

A chemical that kills insects.

Long-term:

Lasting one year or more.

Milligram (mg):

One thousandth of a gram.

Short time:

Lasting 14 days or less.

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Agency for Toxic Substances and Disease Registry (ATSDR). 1992. Toxicological profile for methyl parathion. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information?

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

For more information, contact:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road NE, Mailstop E-29
Atlanta, GA 30333
Phone: 1-800-447-1544
FAX: 404-639-6315



U.S. Department of Health and Human Services
Public Health Service
Agency for Toxic Substances and Disease Registry

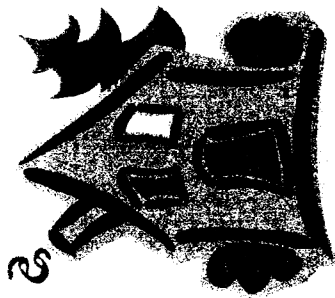
[Link to ToxFAQs Home Page](#)

[Link to ATSDR Science Corner](#)

[Link to ATSDR Home Page](#)

ATSDR Information Center / ATSDRIC@cdc.gov / 1-800-447-1544

Appendix C



Choosing a quality pest control company is an important decision. You want the company to solve your pest problem, but you also want to keep your home safe.

Get estimates from several companies and compare the costs, services and products or techniques they will use, and choose the best price for the services provided.

If you have questions about pest control and pest control companies, call the agencies listed below:

- Better Business Bureau (Southeast MI)
- Michigan Consumer Protection Office, Office of the Attorney General (Lansing, MI)
- Michigan State University, County Extension offices
- Michigan State University, Institute for Environmental Toxicology (E. Lansing, MI)
- Michigan Department of Agriculture, Pesticide and Plant Pest Management Division (Lansing, MI or your regional office):

Region 1 (Upper Peninsula) (906) 786-5462
 Region 2 (Northern MI) (616) 922-5210
 Region 3 (West Central MI) (616) 456-6988
 Region 4 (Thumb & Mid-MI) (517) 758-1778
 Region 5 (Southwest MI) (616) 428-2575
 Region 6 (Central Lower MI) (517) 373-1087
 Region 7 (Southeast MI) (248) 356-1701

Telephone numbers for other agencies can be found in your local directory.

The Urban Pest Education Program (UPEP) provides free brochures on pest problems. For copies, contact the Michigan Department of Agriculture office in your region.

Problems with Pests? Keeping Bugs Out of Your Home
 How to Choose A Pest Control Company
 Questions About Cockroaches
 Questions about Fleas

Prepared by the Michigan Department of Agriculture, with support from UPEP. This brochure may be copied in whole or in part with credit to UPEP.

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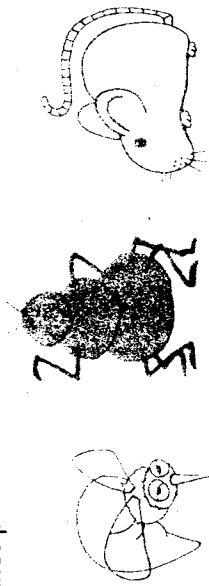
HOW TO CHOOSE A PEST CONTROL COMPANY

Every home has a pest problem from time to time. Some problems can be solved by you with simple prevention measures such as:

- repairing screens and openings under doors
- discarding debris & cleaning food and water spills
- sealing cracks and crevices where pests can enter

Eliminating food, water and a place for pests to hide are parts of an "integrated pest management" (IPM) strategy. IPM is a method that uses a variety of strategies including: exclusion, sanitation, biological control, careful monitoring, and if appropriate, the application of pesticides.

If you have a pest problem you cannot resolve yourself, you may want to call a professional. Professional pest control specialists can take care of infestations of rodents, insects such as termites, roaches and ants; and other nuisance pests.

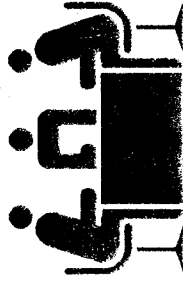


How do you choose a pest control company, and how can you be sure they will do a good job?

Here are some helpful hints to keep in mind as you look for the right company and the right pest control method to resolve your pest problem.

When choosing or interviewing a pest control company:

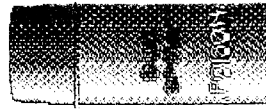
- Ask friends, neighbors or coworkers for recommendations.
- Don't depend solely on advertising or a sales pitch to judge a company's record. Ask for references.
- Is there a guarantee for their work? Take time to understand the company's recommendations for control, any potential health concerns with the treatment options, and discuss any questions you may have.
- Ask how long it will take to solve your pest problem, and how often the company will return to do more work or to track results. Ask the company what other measures they can take to manage the pest problems, or what you can do to reduce future pest problems.
- How does the company keep its staff updated on new techniques, regulations and requirements? Professional organizations and associations tend to keep their members updated.
- Are there any unresolved complaints against the company? Call the Better Business Bureau, the Consumer Protection Division of the Office of the Attorney General, or the Michigan Department of Agriculture.



If a pesticide will be applied . . .

Some companies may use pesticides, along with other control measures. Here are some things you need to know about companies that apply pesticides:

- Is the company licensed? In Michigan, pest control companies that apply pesticides must be licensed by the Michigan Department of Agriculture.
- Does the company have insurance? Michigan law requires that pest control companies carry liability insurance to protect you in case of an accident, and workers compensation insurance to protect you if a worker is injured.



Is the applicator certified or registered by the Michigan Department of Agriculture?

In order to apply pesticides commercially, a person must be a certified applicator or a registered technician. Individuals gain certification by taking a special state test. Ask to see the applicator's certification or registration credential and check the expiration date.

Regulation 637 requires written information about the pesticide application be provided to the customer no later than the time of the application, including:

- (1) the name, address, telephone number of the firm providing service
- (2) full name of the applicator
- (3) a general description of the target pest(s) to be controlled
- (4) a list of the pesticides applied (including the common name of the active ingredient)
- (5) the time and date of the application
- (6) any precautionary warnings.



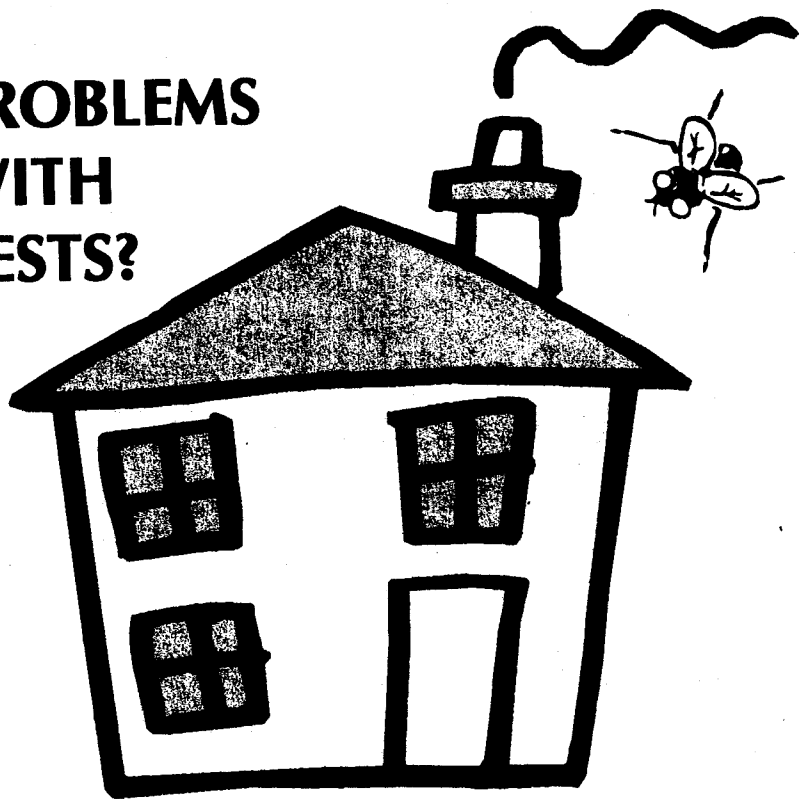
Ask about special precautions for reentry into the home or use of the area where any pesticides were applied.

If pesticides will not be applied . . .

Some companies use pest management procedures such as biological control, mechanical exclusion, trapping or other methods. Here are some things you need to know about these companies:

- Ask for references from customers and information about the company's expertise and experience using their recommended approach.
- Request written information about your target pest(s) and the management procedures to be used.

PROBLEMS WITH PESTS?



KEEPING BUGS OUT OF YOUR HOME

When you find a bug, ask these questions:

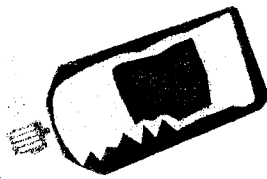
- ✓ What is it and how many are there?
- ✓ Where is it coming from?
- ✓ How can I get rid of it?
- ✓ Can I keep it out of my house?



O.K. You found



a bug in your home.
Maybe more than one.



You use bug spray to kill it.
The bug is dead.
The problem is solved.

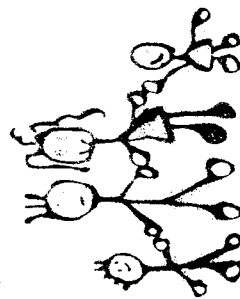
Or is it?

Pesticides (like bug sprays) do help to get rid of pests. But they may not keep pests from coming back.

Pesticides need to be used carefully to make sure they work.

If used improperly, pesticides can poison people or pets, or make them sick.

Children, people with health problems (like asthma), older adults and pets may be more sensitive to pesticides.



Is there a better way to get rid of pests in your home? Ask yourself these 4 questions:

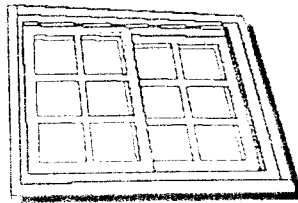
1. What is it and how many are there?

- Don't panic at the sight of one insect. Every home has bugs from time to time. Is there just one, or a bunch? If you find only one, you may not have a problem. That bug may have just wandered in.
- Try to identify the bug. Is it a cockroach, spider, earwig, ant . . . ? You need to know what it is to decide the best way to deal with it. Some bugs aren't a problem, and can even help to control other pests.
- For some pests (cockroaches, ants, mice & others), finding just one may mean that more are around.



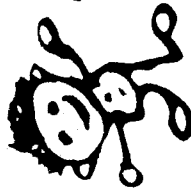
2. Where is it coming from?

- Find out how the pest got in. Look for a hole in the wall, a crack in the floor, or a torn window screen. Look for gaps around water pipes, or electrical and gas lines that come into your home.
- Sometimes bugs "hitchhike"—they come in with your newspaper, in boxes, on your clothes, in pop bottles, in bags of pet food or flour.
- Where did you find the bug? Look for food or water nearby. Pests that find food or water will stay longer.



3. How can I get rid of it?

- **Try the old-fashioned way for some bugs—step on them or use a fly swatter.** Also try wiping them up with a wet, soapy sponge or paper towel, or vacuuming (and throw away the bag).
- **Use a trap.** Ant traps, cockroach “motels”, mice traps and others catch the pests and either keep them from getting out or kill them. Use the right trap for your pest. Follow all directions on the package.



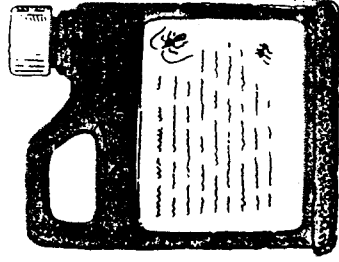
*Put traps where kids & pets can't reach them.
Traps may contain pesticides that could be harmful if eaten or touched.*



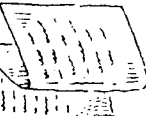
- **Hire a professional company** to help you get rid of the pest. If a company uses pesticides, it must have a special Michigan license. Read the brochure “How to Choose a Pest Control Company” (see page 8).
- **You may decide to use pesticides yourself. BE CAREFUL.** Pesticides come in different forms—sprays, bug “bombs”, dusts, baits. Children, people with health problems (like asthma), older adults and pets may be more sensitive to pesticides. Remember that using pesticides alone won't keep bugs from coming back.

CHOOSE THE PROPER PESTICIDE. Some pesticides kill bugs on contact, and others have to be eaten by the bugs. Pesticides are not “one size fits all.” Match the product to the pest, and think about where you will be using it. For example, some products can't be used where food is prepared.

READ THE PESTICIDE LABEL AND FOLLOW THE DIRECTIONS.



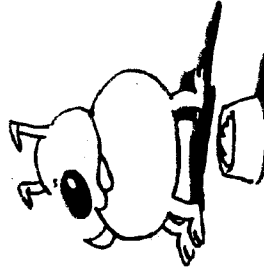
The label is on the front and back of the container. It tells you important things: what pests it kills, how much to apply, where to apply it, how to protect yourself with gloves or glasses, what to do if someone is poisoned.



All legal pesticides have a label with directions, and are in special containers. Don't buy or use products mixed in food or household containers, or products without labels.

DON'T OVERUSE A PESTICIDE. The label tells you how much to use; use only that amount or less. More is NOT better—it could expose you or your family to unneeded pesticides, it's illegal and it's a waste of your money.

CHOOSE PESTICIDES THAT ARE LEAST “TOXIC”. Pesticide labels say “CAUTION”, “WARNING” or “DANGER”. These words tell you something about how harmful the product is. “Caution” means the least harmful, “Warning” means more harmful, and “Danger” means very harmful. Choose products labeled “CAUTION” when you can.

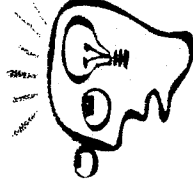


Think about who might touch or breathe the pesticide after you apply it.

Sprays, liquids and “bug bombs” may leave a film or a vapor that kids or pets could crawl into or breathe.

Always wash your hands after using a pesticide, and open windows to get fresh air into the room.

ASK QUESTIONS. There are many pesticides to choose from. If you want to know more about different products, ask the salesperson or call the product manufacturer phone number on the label.



*Buy pesticides from reliable stores, and beware of “miracle” cures.
No pesticide can guarantee control of pests.
“Quick-fix” products may not be legal, and could be harmful.*

4. Can I keep it from getting in again?

- Bugs really can be pests. You get rid of them once, but they may come back again. That's because you've got something they want—food, water, a place to live.
- DON'T BE A GOOD HOST. If bugs can't find crumbs to eat, a leaky faucet to drink from, or a quiet, dark crack to live in, they won't stay.
- Simple home repairs, cleaning and proper food storage are the best ways to keep pests out.



up toilets,
pipes or drains.

Caulk around windows and floor boards to keep out crawling insects.

Remove damp or wet wood.

Keep empty pop bottles outside or in sealed, plastic bags.



Wipe up food scraps and clean dishes right away. Keep food, including pet food, in sealed containers. Clean up grease or food that splashes around stoves and sinks.

- Keep an eye on things. If bugs reappear, look around for spilled food or liquid, or check for holes in screens, cracks in the floor, leaky toilets, or other repair problems.

Questions? Need More Information?

This brochure doesn't have all of the answers you may need. In the Detroit area, contact these resources for advice about solving pest problems and safe use of pesticides. Outside the Detroit area, contact your county MSU extension office.

☐ Pests and solving pest problems

MSU Extension--

Wayne County Master Gardener Hotline
Oakland County Yard & Garden Helpline

313-833-3268
248-858-0902

Detroit Health Department--
Community & Industrial Hygiene

313-876-4516

Michigan Pest Control Association

248-598-7205

Detroit Department of Public Works (rodent control)

313-935-4700

☐ Licenses for pest control companies; pesticide laws

Michigan Department of Agriculture
Region 7, Southfield office

248-356-1701

Better Business Bureau

248-644-9100

☐ Pesticide poisonings and health concerns

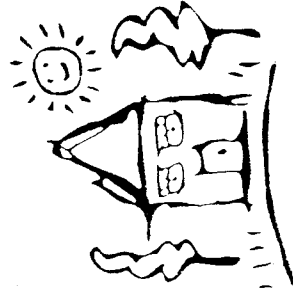
Poison Control Center

1-800-764-7661
(1-800-POISON-1)

Michigan Department of Agriculture, Toxicology

517-335-6529

Your family doctor or health center
may also have information.



REMEMBER . . .

- **Pesticides are poisons.** Keep all pesticides locked away from kids and pets. Buy and mix only what you need. Keep pesticides in the original containers with the labels.
- **If you think someone has been poisoned, don't delay. Call the Poison Control Center at 1-800-764-7661.**



Keep this phone number with your emergency phone numbers.

Try to have the pesticide container with you when you call.

The Urban Pest Education Program (UPEP) provides free brochures on pest problems. For copies, contact the agencies listed on page 7, or the Michigan Department of Agriculture office in your region.

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Questions about Fleas

Prepared by the East MI Environmental Action Council, with support and cooperation from the Michigan Department of Agriculture, Michigan Nursery and Landscape Association, Michigan Pest Control Association, Michigan State University (MSU) Department of Entomology, MSU Extension, MSU Pesticide Education Programs, and Region 5, Environmental Protection Agency. This flyer may be copied in whole or in part with credit to UPEP.

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